ANALYSIS OF THE COSTS OF THE ADMINISTRATION'S STRATEGIC DEFENSE INITIATIVE 1985-1989

Staff Working Paper

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Congressional Budget Office
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NOTE

Unless otherwise indicated, all years referred to in the text are fiscal years. All dollars are budget authority dollars that include anticipated inflation using the Administration's economic assumptions.

INTRODUCTION AND SUMMARY

Last year President Reagan called for the exploration of defensive technologies that would render nuclear weapons "impotent and obsolete." The resulting Administration plan—called the Strategic Defense Initiative (SDI)—has sparked intense debate on the technological and arms control implications of creating a novel strategic defensive system based largely in space.

Many in the Congress are also interested in the costs of the SDI. This paper, prepared at the request of the Arms Control, Oceans, International Operations and Environment Subcommittee of the Senate Foreign Relations Committee, examines near-term cost trends. It also discusses whether current SDI plans include all the efforts needed to support a strategic defense.

In summary, the paper finds that:

- The Administration plans substantial growth in SDI spending over the next two years; from $991 million in 1984 to $3,790 million in

1986. Press reports suggest continued though slower growth through 1989. While such rapid growth is not atypical of newly started research and development (R&D) programs, the SDI will consume an increasing share of DoD R&D resources, growing from about 4 percent in 1984 to about 16 percent by 1989.

- Everything else being equal, growth in SDI funds between 1984 and 1985 would have been larger had the Administration funded the Army's Ballistic Missile Defense (BMD) program at levels planned in its February 1983 budget. Changes in BMD funding plans were probably tied to the shift in basing plans for the MX missile. BMD changes not only offset growth in SDI but may also portend a more fundamental shift in the Army's BMD effort, emphasizing development of a capability to defend entire areas of the United States sometime in the future rather than emphasizing the defense of specific military installations in the nearer term. This could be of concern to those who feel the United States may need to deploy a near-term ballistic missile defense in response to a potential Soviet deployment.

- There are questions about the inclusiveness of the Administration's current definition of SDI. The broad definition of strategic defense implied by the President and stated explicitly

by others in the Administration embraces defense against all forms of nuclear attack. But the SDI currently contains funds for research on defense against ballistic missiles. Important components of a more comprehensive defense--most notably air defense--are missing. In addition, there appear to be a number of relevant programs that are not currently included in SDI even by the narrower definition of defense against ballistic missiles.

In accordance with the mandate of the Congressional Budget Office (CBO) to provide objective and impartial analysis, the paper makes no recommendations.

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BACKGROUND

On March 23, 1983, President Reagan called for the United States to develop the means of rendering nuclear weapons "impotent and obsolete." It would do this, he said, by developing defenses against enemy nuclear weapons capable of destroying them after their launching but before they reached this country. Currently, the United States relies largely on the deterrent capability of its strategic offense, which is designed to discourage an attack by maintaining substantial retaliatory capability that could survive an enemy's first strike.

With this speech the President set in motion a consolidation and expansion of ongoing research programs for defense against nuclear weapons. The resulting long-term research and development plan—known as the Strategic Defense Initiative (SDI)—calls for devoting nearly $26 billion over the next six years to determining the applicability of technologies and systems concepts to the strategic defense mission. 1/ Many of these

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1. Although the Department of Energy will be involved in specific aspects of SDI research, the Department of Defense (DoD) will be the focus for the SDI and will spend the large majority of SDI funds. Overall program management has been consolidated within the Office of the Secretary of Defense (OSD), with the program manager, Lt. Gen. James A. Abrahamson, reporting directly to the Secretary. Each of the services and certain defense agencies, however, will continue to carry out the actual research efforts.

technologies involve such exotic approaches as destroying missiles with directed energy or "beam" weapons and establishing new space-based surveillance and weapons platforms. Systems concepts include the deployment of novel, multilayered defenses that would engage weapons not only as they approached their targets but also at other points along their trajectories, including shortly after launch. SDI also continues existing development efforts like the Army's Ballistic Missile Defense program, with an emphasis towards integration into a multilayered defense.

Full-scale development of most SDI weapons would probably not occur until the 1990s, and deployment of most weapons would not take place until early in the next century. Nonetheless, the SDI would be a first step toward creating an ascendancy of strategic defense over offense, in line with President Reagan's call for a "break out of a future that relies solely on offensive retaliation for our security."

Plan of the Paper and Source of Data

Many have expressed concern both about the feasibility of this plan and about its cost. This paper examines in detail the 1984-1986 spending plan for SDI that was submitted with the Administration's February 1984 budget. (There were no major changes in the May revision to that budget.)

As part of that examination, the paper notes changes in a major, ongoing strategic defense program--the Army's Ballistic Missile Defense (BMD) effort--which offset some of the growth in SDI funding between 1984 and 1985. Finally, the paper raises some questions about the total cost of the SDI program by indicating types of research that are related to SDI but apparently not included in the Administration's current estimates of the cost of the SDI.

The paper does not attempt to project the ultimate costs of designing and deploying a strategic defense system. It is too early in the research and development process to do more than speculate on what those might be. Nor does the paper attempt to evaluate the potential of defensive systems to protect the United States against attacks. Such analyses are, however, being attempted in other studies being done for the Congress, such as the ongoing effort by the Office of Technology Assessment.

Data for the paper were drawn primarily from the descriptive summaries of research, development, test, and evaluation (RDT&E) programs that accompanied the 1983-1985 budget submissions. These included RDT&E programs run by the individual services, defense agencies, and the Office of the Secretary of Defense. All these data provide information only through 1986; official budget figures beyond 1986 are unavailable because the DoD typically does not provide detailed, future

RDT&E budget plans to the Congress. But the paper notes estimates for years beyond 1986 that have been reported in the press.

TRENDS IN COSTS

Growth and Sources of Funding in 1984 and Beyond

The latest Administration budget calls for a steep growth in SDI funding: from $1,777 million (79 percent growth) in 1985 to $3,789.8 million (113 percent growth) in 1986 (see Table 1). 2/ While large, these growth rates are not uncharacteristic of new RDT&E efforts. In 1984, all SDI funds except for a $50 million contingency fund come from programs in existence

TABLE 1. GROWTH AND SOURCES OF FUNDING FOR SDI, BY FISCAL
(In millions of nominal dollars of budget authority)

	1984	1985	1986
Funds from Existing Program Elements	$941.0	$1,527.0	$1,809.4
New Funds	50.0	250.0	1,980.4
Total	$991.0	$1,777.0	$3,789.8

2. These figures are based on proposals submitted to the Congress in the Administration's February 1984 budget plan. In recent testimony before the House Appropriations Defense Subcommittee, Lieutenant General Abrahamson indicated that internal DoD plans--formulated before creation of the SDI--would have funded SDI-type research efforts at about $1,527 million in 1985, $2,600 million in 1986, and $15,000 million for the period 1985-1989. Note also that in its report on the 1985 authorization bill the House Armed Services Committee recommended the deletion of $407 million from the SDI.

before the President's speech. By 1986, however, new funds comprise 52 percent of total SDI funding.

Detailed plans for SDI spending beyond 1986 are not routinely made available. But estimates published by the press show SDI funding continuing to grow through 1989, though at a decreasing rate. According to these reports, SDI funding grows an average of 25 percent per year from 1987 to 1989 (see Table 2).

SDI Will Soon be a Substantial Part of DoD Research Budget

With its substantial growth, SDI will consume an increasing share of DoD research funds. Table 2 compares funding for SDI through the five-year defense plan with overall funding for DoD research and development. In 1984—the first year of the program—funding for SDI comprises only 4 percent of the DoD RDT&E budget; by 1989, SDI takes up 16 percent, or more than one-sixth, of the total DoD research budget.

Change in Army BMD Funding and Growth in SDI

Everything else being equal, growth in SDI funding between 1984 and 1985 would have been larger had the Administration followed the plans in its

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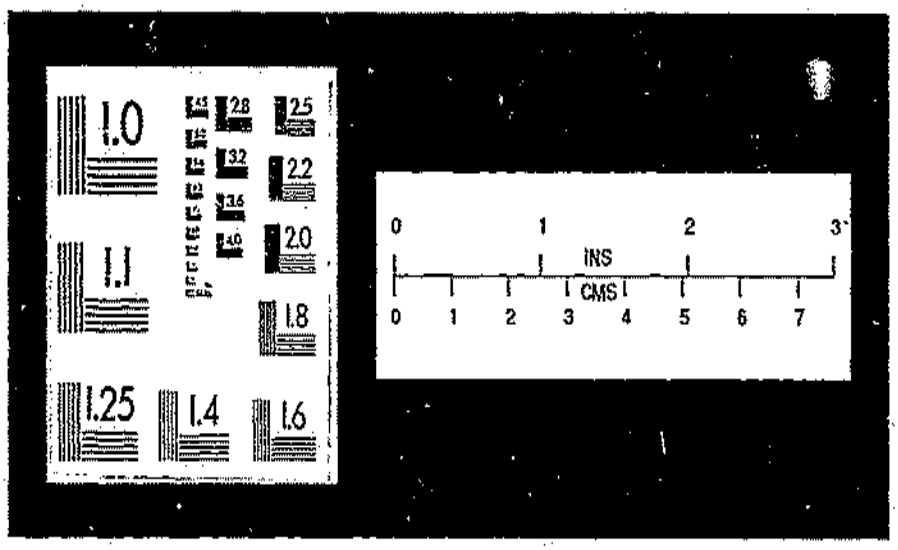

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TABLE 2. COMPARISON OF FUNDING FOR SDI AND FOR DoD RESEARCH, DEVELOPMENT, TEST, AND EVALUATION, BY FISCAL YEAR (In millions of nominal dollars of budget authority)

	1981 Actual	1982 Actual	1983 Actual	1984 Plan	1985 Plan	1986 Plan	1987	1988	1989
DoD RDT&E	16,634	20,103	22,825	26,368	33,985	37,797	38,426	43,717	47,099
Annual Percent Growth		21	14	18	26	11	2	14	8
SDI				991 a/	1,777 a/	3,799 a/	4,989 b/	6,260 b/	7,406 b/
Annual Percent Growth					79	113	32	25	18
As percent of DoD RDT&E				4	5	10	13	14	16

a. From 1985 President's Budget (submitted in February 1984)

b. From Defense Daily, February 3, 1984, p. 192

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February 1983 budget for the Army's Ballistic Missile Defense (BMD) program. Army BMD is a major part of SDI; in 1984 it makes up 52 percent of the SDI budget. But in its February 1984 budget plan, the Administration requested some $572 million less for Army BMD in 1985 than projected in the February 1983 plan (see Table 3). This may reflect elimination of plans to deploy a ballistic missile defense to aid in the survivability of the MX missile now that the decision has been made to base the MX missile in existing Minuteman silos. 3/ Whatever the reason, the decrease in planned spending for BMD offsets some of the growth in the SDI between 1984 and 1985.

Potential Shift in BMD Priorities in SDI

The new SDI budget structure also appears to change the funding of the Army BMD program in ways that shift priorities toward longer-term rather than near-term systems. In recent years, substantially more funds

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3. The February 1983 budget showed substantial growth in BMD funding for 1985, predicated largely on systems development for possible defense of the MX missile in Dense Pack. Many felt that, had the Administration and the Congress elected to deploy the MX missile in Dense Pack, some sort of ballistic missile defense system would be associated with it to improve the survivability of the MX missile. Now that the Administration has chosen instead to place the missiles in 100 existing Minuteman silos, it is unlikely that--given the constraints of the Anti-Ballistic Missile (ABM) Treaty--any of the Army's current BMD programs could substantially improve their survivability.

TABLE 3. CHANGE IN SPENDING PLANS FOR ARMY BALLISTIC MISSILE DEFENSE, FISCAL YEARS 1984-1986 (In millions of nominal dollars of budget authority)

Plan	1984	1985	1986
February 1983 - Requested	709.3	1,564.1	NA
Appropriated a/	517.3	b/	b/
February 1984 - Requested c/	--	992.1	1,104.6

NA = Not Available

a. As amended by additional SDI funds in 1984.

b. The Congress does not appropriate funds beyond the budget year.

c. Excludes money that is not part of SDI.

have been devoted to the BMD systems technology program--efforts directed at the state-of-the art technology needed for a deployable BMD--rather than the more basic research efforts of the advanced technology program. Under the reallocation of resources for SDI in the February 1984 plan, however, there has been a shift away from this pattern. February 1983 plans for Army BMD in 1984 would have allocated roughly 30 percent of total BMD dollars to advanced technology and 70 percent to systems technology; February 1984 plans change these shares to 45 percent and 55 percent, respectively. Published data do not indicate whether this shift will continue beyond 1984. If it does, it may represent an emphasis--consistent with the SDI goal of a more comprehensive but long-term strategic defense--on longer-term development of the capability to defend entire

areas of the United States rather than specific targets like missile silos. But it could delay—though not foreclose—the option of deploying in the relatively near term a BMD system to defend hardened missile silos or other strategic assets in the event of a Soviet BMD deployment, which some analysts fear.

Changes in SDI Budget Structure That Preclude Estimating Spending Planned Before 1984

In light of the planned growth in SDI and shifts in priorities, it would have been useful to know whether planning for SDI-type projects before 1984 anticipated substantial funding increases later on. This might have indicated how much change the formulation of the SDI actually caused in funding.

Estimates of spending on SDI-type projects planned before 1984 cannot readily be made, however, because of changes in the budget structure. Starting with the 1985 budget plan, the DoD created five new program elements—all under the control of the Office of the Secretary of Defense—that form an umbrella under which future SDI research is to be conducted. (Program elements are the basic building blocks used to structure and describe the defense budget.) The new program elements are:

- SDI Surveillance, Acquisition, and Tracking (Program Element 63220D)
- SDI Directed Energy Weapons (Program Element 63221D)
- SDI Kinetic Energy Weapons (Program Element 63222D)
- SDI Systems Analyses and Battle Management (Program Element 63223D)
- SDI Support Programs (Program Element 63224D)

Beginning with the budget submitted by the President in February 1984, all DoD SDI funds for the years 1985 and beyond have been placed in these five program elements. In budgets submitted earlier, funds are still spread through 27 military service and defense agency program elements. Because many of the 27 program elements are broad in scope, anywhere from a few percent to all of any given program element may be subsumed in the new SDI structure. For 1984 DoD provided a "roadmap" of how the 1984 SDI-applicable funds in each older program element would match up with the five new SDI program elements. Table 4 shows how one of the five new SDI program elements was created (the remaining four are shown in the Appendix).

No such roadmap is available, however, for years prior to 1984; thus estimates of SDI-type spending in earlier years cannot be made. Nor can

TABLE 4. EXAMPLE OF CHANGE IN BUDGET STRUCTURE FOR PROGRAM ELEMENT 63220D (In millions of nominal dollars)

1984 Budget Structure			1985 Budget Structure		
Program Element	Name	$ Associated with SDI	Program Element	Name	$ Associated with SDI
63304A	Army Ballistic Missile Defense - Advanced Technology	82.0			
63308A	Army Ballistic Missile Defense - Systems Technology	172.4			
62101F	Geophysics	5.1			
63424F	Missile Surveillance Technology	7.7			
63424F	Advanced Warning Systems	20.8	63220D	SDI/Surveillance, Acquisition & Tracking	366.5
63428F	Space Surveillance Technology	22.5			
61101E	Defense Research Sciences	6.3			
62301E	Strategic Technology	31.2			
62711E	Experimental Evaluation	10.0			
62715H	Defense Nuclear Agency	8.5			
	Total	366.5			

Note: For other SDI program elements, see the Appendix.

TABLE 5.

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TABLE 5. COMPARISON OF FUNDING FOR SDI-ASSOCIATED PEs AND DoD RESEARCH, DEVELOPMENT, TEST, AND EVALUATION, FISCAL YEARS 1981-1984 (In millions of dollars of nominal budget authority)

	1981 Actual	1982 Actual	1983 Actual	1984 Plan
DoD RDT&E	16,634	20,103	22,825	26,868
Annual Percent Growth		21	14	18
SDI-Associated PEs a/	1,529	1,973	2,199	2,646
Annual Percent Growth		29	12	20
As percent of DoD RDT&E	9	10	10	10

a. From 1984 President's budget (February 1983), according to DoD. Includes funds that do not become associated with SDI in the 1985 budget, and excludes new SDI funds.

CBO estimate the amount of SDI-type spending in 1985-1989 that was planned in earlier budgets.

To provide some notion of trends in spending before 1984, CBO compared the historical growth in the 27 program elements from which the SDI funds were transferred with historical growth in the overall DoD research and development budget. Table 5 shows that, from 1981 to 1984, these associated program elements grew at about the same rate as the overall RDT&E budget and represented a relatively constant 9-10 percent share of the research and development effort. While this may suggest that

SDI-type funding was not increasing rapidly in earlier years, it is not conclusive evidence. In most cases only a portion of each of the 27 program elements is assigned to SDI; so growth in all the 27 program elements may not accurately reflect growth in SDI-type funding.

HOW INCLUSIVE IS THE DEFINITION OF SDI COSTS?

There are, of course, many programs that could contribute in whole or in part to strategic defense. The Administration has chosen a set to define as SDI, and these programs were the basis for the above discussion. But there are other programs that many might argue should be included in SDI but are not.

The choice of programs to be included--and hence total cost--largely depends on the scope and goals of the SDI effort, and some of the Administration's statements regarding the goals of SDI have been ambiguous. Funding for SDI currently includes research and development on antiballistic missile capability. However, on March 27, 1984, Secretary Weinberger said that the goal of the program is to create a "thoroughly reliable and effective defense against both ballistic missiles and cruise missiles." 4/ This, together with President Reagan's call for rendering nuclear weapons "impotent and obsolete," implies the goal of a more comprehensive strategic defense system that could defend against all major

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4. Dr. George A. Keyworth, Science Advisor to the President, also noted in recent testimony before the Senate Foreign Relations Committee that the Congress should not infer "that we consider submarine, air breathing, or tactical nuclear weapons any less deadly. They are also to be addressed with the Defense Initiative."

TABLE 6. EXAMPLES OF PROGRAMS NOT INCLUDED IN SDI BY THE BROADER DEFINITION (In millions of dollars of budget authority)

Program Element	Name	1984	1985	1986
64406F	Anti-Satellite (ASAT)			
	R&D a/	203.6	143.3	101.7
63226E	Air Defense Surveillance/ Warning (Teal Ruby)	31.5	30.0	30.0
63401F	Research on Satellite Power & Survivability (Advanced Spacecraft Technology)	6.3	31.0	29.0

a. The ASAT program also includes the following funds for procurement and construction: $19.3 million in 1984, $117.6 million in 1985, and $153.0 million in 1986.

types of nuclear attack, including attack by strategic bombers and cruise missiles.

Table 6 gives major examples--though not a comprehensive list--of programs that could arguably be part of the SDI by the broader definition. For example, SDI funding excludes the costs of the "Teal Ruby" program to develop a new system for warning against attack by bombers and cruise missiles. SDI funding also excludes costs for the anti-satellite program (ASAT)--a system designed to shoot down enemy satellites in low-earth orbits. The ASAT program would almost certainly be a necessary part of a

system to defend comprehensively against nuclear attack. Among other roles, it might be needed to defend U.S. satellites that are assuming increasingly greater importance for tactical warning and command and control. Moreover, ASAT technology could be useful in the development of a ballistic missile defense system.

More generally, the Administration's current definition of SDI excludes much of the cost associated with defending the United States against attacks by enemy bombers. Yet air defense would be an important part of any comprehensive strategic defense. Indeed, the House Armed Services Committee, in its report on the 1985 defense authorization bill, expressed its concern regarding overall air defense efforts and their relationship to the SDI.

Even by the narrower definition of SDI that limits it to ballistic missile defense, a number of projects closely related to SDI could have been included in the funding estimates. The summaries that accompany the 27 program elements from which SDI funds are drawn describe projects that relate to SDI but are not included in SDI funding. The basis upon which portions of these program elements are included or excluded is not readily apparent, particularly since the funds transferred to SDI are rarely

TABLE 7. EXAMPLES OF ASSOCIATED RESEARCH NOT INCLUDED IN SDI FUNDING (In millions of nominal dollars of budget authority)

Program Element	Name	1984	1985	1986
63650F	Advanced Radiation Technology	46.7	12.4	37.1
62301E	Strategic Technology	NA	53.7	80.4
62707E	Particle Beam Technology	33.1	17.4	32.4
61102A	Research on Missiles and High Energy Lasers	4.5	8.0	7.6
62307A	Laser Weapons Technology	15.6	21.2	22.3
63304A/ 63308A	Army BMD	NA	1.5	38.2
63424F	Missile Surveillance Technology	NA	7.0	10.0
65806A	DoD High Energy Laser Facility	36.2	39.4	38.9

NA = Not Available

associated with a particular project or projects. Table 7 provides some examples, most of them pertaining to research in basic beam weapons or laser weapons. For example, the descriptive summary for Particle Beam Technology states that surface-based particle beam research and development is not part of SDI, but space-based particle beam research is. But there is likely to be a surface-based component in any sort of layered

defensive system since most such concepts envision attacking incoming missiles again just before they reach their targets in the United States.

Table 7 also provides other examples of other programs or parts of programs that are excluded from SDI but seem to support it. For instance, in the plan for 1985 all but $1.5 million of the Army BMD program is subsumed under SDI; indeed, the Army BMD program is a conspicuous part of SDI. In 1986, however, $38.2 million of Army BMD research is funded outside of the SDI effort. Likewise, Missile Surveillance Technology is included in SDI in 1984 but not in 1985 or 1986, although its technology supports the Advanced Warning System, which is part of the SDI.

Together, Tables 6 and 7 raise questions about the inclusiveness of the current definition of SDI and hence about the total cost of strategic defense.

APPENDIX

TABLE A-1. EXAMPLE OF CHANGE IN BUDGET STRUCTURE FOR PROGRAM ELEMENT 63221D (In millions of nominal dollars)

1984 Budget Structure			1985 Budget Structure		
Program Element	Name	$ Associated with SDI	Program Element	Name	$ Associated with SDI
63304A	Army Ballistic Missile Defense – Advanced Technology	8.5			
63308A	Army Ballistic Missile Defense – Systems Technology	12.8			
62101F	Geophysics	0.7			
63402F	Space Test Program	4.9			
62601F	Advanced Weapons	6.4			
63605F	Advanced Radiation Technology	28.2			
61153N	Defense Research Sciences	5.2	63221D	SDI/Directed Energy Weapons	322.5
62768N	Directed Energy Technology	7.9			
62107E	Third Generation Nuclear Weapons	8.0			
62301E	Strategic Technology	72.5			
62707E	Particle Beam Technology	10.0			
62711E	Experimental Evaluation	127.6			
65805E	Tri-Service Laser Range	25.0			

TABLE A-2. EXAMPLE OF CHANGE IN BUDGET STRUCTURE FOR PROGRAM ELEMENT 63222D (In millions of nominal dollars)

1984 Budget Structure			1985 Budget Structure		
Program Element	Name	$ Associated with SDI	Program Element	Name	$ Associated with SDI
63304A	Army Ballistic Missile Defense - Advanced Technology	117.0			
63308A	Army Ballistic Missile Defense - Systems Technology	63.3			
62602F	Conventional Munitions	1.3	63222D	SDI/Kinetic Energy Weapons	195.8
63438F	Satellite Systems Survivability	5.5			
61101E	Defense Research Sciences	1.0			
62702E	Tactical Technology	7.7			
	Total	195.8			

TABLE A-3. EXAMPLE OF CHANGE IN BUDGET STRUCTURE FOR PROGRAM ELEMENT 63223D (In millions of nominal dollars)

1984 Budget Structure			1985 Budget Structure		
Program Element	Name	$ Associated with SDI	Program Element	Name	$ Associated with SDI
63304A	Army Ballistic Missile Defense - Advanced Technology	18.2			
63308A	Army Ballistic Missile Defense - Systems Technology	30.1	63223D	SDI/Systems Analyses and Battle Management	82.7
63603F	Space Laser Program	29.2			
62715H	Defense Nuclear Agency	5.2			
	Total	82.7			

TABLE A-4. EXAMPLE OF CHANGE IN BUDGET STRUCTURE FOR PROGRAM ELEMENT 63224D (In millions of nominal dollars)

1984 Budget Structure			1985 Budget Structure		
Program Element	Name	$ Associated with SDI	Program Element	Name	$ Associated with SDI
64711F	System Survivability (Nuclear Effects)	3.6			
63211F	Aerospace Structures and Materials	7.3			
63314F	Strategic Laser	2.8			
62715H	Defense Nuclear Agency	3.3			
63304A	Army Ballistic Missile Defense - Advanced Technology	3.5	63224D	SDI/Support Programs	33.5
61101E	Defense Research Sciences	3.0			
	Other Reprogramming	10.0			
	Total	33.5			